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Report of the sixth session of the

INDO-PACIFIC FISHERY COMMISSION/ INDIAN OCEAN FISHERY COMMISSION JOINT WORKING PARTY OF EXPERTS ON INDIAN AND WESTERN PACIFIC FISHERY STATISTICS

Albion, Mauritius
6-10 May 1985

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

REPORT

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PREPARATION OF THIS REPORT

This is the final version of the report as approved by the Sixth Session of the Indo-Pacific Fishery Commission/Indian Ocean Fishery Commission (IPFC/IOFC) Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics.

Distribution

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ABSTRACT

The final report of the sixth session of the Indo-Pacific Fishery Commission/Indian Ocean Fishery Commission Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics, held in Albion, Mauritius, from 6 to 10 May 1985 is presented. Major topics considered were: (1) actions taken on recommendations from the fourth and fifth sessions of the Working Party; (2) country reports dealing with national fishery statistics and with progress made at the national level on data collection; (3) statistical methodology for shared stocks; (4) the quality problem of national fisheries statistics; (5) quick methods in data collection; (6) major fishing areas and sub-divisions. The recommendations of the session are summarized. Two papers on the sampling and analysis of shared stocks data are included as appendices.

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OPENING

1. The sixth session of the IPFC/IOFC Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics met at Albion Fisheries Research Centre, Mauritius, from 6 to 10 May 1985. Participants from 8 countries and from FAO attended the meeting. The list of participants is given in Appendix A.

2. At the opening session Dr. G. Bazigos, Technical Secretary of the Working Party, on behalf of the Director-General of the FAO, thanked the Government of Mauritius for its generous hospitality in hosting the meeting, and referring to the Working Party, made a statement on its history and present status.

3. Hon. Kishore Deerpalsingh, Minister of Agriculture, Fisheries and Natural Resources, welcomed the participants and, in opening the meeting, stated that the outcome of the Working Party should certainly facilitate the management of fish stocks for the joint benefit of all countries in the regions. He emphasized the need for improving the quality of fishery statistics and in this connection he thanked the member countries and the FAO for their contribution to this exercise.

PROCEDURAL AND ORGANIZATIONAL MATTERS

4. Mr. Chandrashen Ramjee Samboo from Mauritius was unanimously elected Chairman of the meeting. The participants also approved the agenda (listed in Appendix B) and appointed Mr. C. Stamatopoulos (FAO) as Rapporteur.

ACTION TAKEN ON RECOMMENDATIONS RESULTING FROM THE FOURTH AND FIFTH SESSIONS OF THE WORKING PARTY

5. Reported action referred to items (7.3), (7.4), (7.6), (7.8), (7.9) and (7.10) of the Fourth Session and to items (5), (7), (8) and (15) of the Fifth Session. The Technical Secretary informed the participants that this will be the last session of the Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics.

6. The participant from the Philippines stated that most of the recommendations that had been made had been complied with, although there were still problems of an administrative rather than a technical nature. The national statistical system had been reinforced since 1976 with the adoption of a statistical sampling programme. However, despite the availability of figures on quantities caught, the rate of exploitation of the fish stocks remained unknown because the existing data did not include fishing effort exerted by fishing ground and therefore they were good only for general estimations and not for management advice.

Species classification

7. The participant from New Zealand stated that the national species classification had been greatly improved during the last years and that the effort for further improvement of the quality of the related statistics was continuing. It was mentioned that in the past a number of discrepancies had occurred in the national lists of species classifications between the statistics of New Zealand and those of other member countries due to confusion over local names and that there was still some work to be done in connection with this problem.

8. The participant from Thailand said that there were problems in the Western Pacific Region related to species classification and referred to the varying species breakdowns used by different countries. He expressed the opinion that FAO or SEAFDEC should undertake the preparation of an exhaustive list of all species known in the region to be used for the standardization of species when collecting or presenting statistics.

This list would be based on "check-list" type questionnaires sent to and completed by the countries, taking into account the existing species identification sheets for the Region produced by FAO.

9. The participant from Japan expressed the view that a further division of the regions into sub-regions would result in a much more practical and manageable system for the identification of species and fishing methods.

10. The participant from People's Democratic Republic of Yemen stated that in some sectors the scientific species classification system gave poor results, particularly when dealing with artisanal fisheries, due mainly to the lack of trained and experienced recorders.

11. The participant from India emphasized the need for improving the system of species identification and made reference to a recent national programme by which some 1,000 common marine species of the Indian seas had been catalogued. In addition, efforts were being made for the preparation of species identification sheets. In the classification process the species identification sheets produced by FAO were taken into account.

12. The participant from Tanzania stated that cases of species mis-identification would have occurred less frequently if appropriate field-oriented guides were introduced in the collection process of the statistics and expressed the view that FAO's contribution in this area would be of great help.

Classification of fishermen

13. The participant from Mauritius stated that improvements to the national statistical system made it possible to identify and locate the full-time fishermen and that another census would be conducted in 1986 for the identification of part-time and occasional fishermen. Referring to sports fishing he mentioned that for big game the catches sometimes accounted for about 25% of the total production of fresh fish.

14. The participant from New Zealand stated that in the national statistical system there was no distinction between full-time and part-time fishermen and that licensing was based on income and performance criteria. Recent information indicated an increase in sports and recreational fishing. Tagging experiments showed that recreational fishing sometimes accounted for a significant proportion of the catches for some species in some areas.

15. The participant from Japan stated that in the national statistical system income criteria were used for the classification of fishermen into the categories of: full-time (99-100% of income coming from fishing); part-time type 1 (50-99% of income coming from fishing) and part-time type-2 (less than 50%). It was mentioned that recreational fishing, minor in the past, had increased to the extent that the authorities were now devising regulations to control it.

16. The participant from Thailand said that the national statistical system classified fishermen into the three categories: full-time, part-time/major, part-time minor, using fishing time criteria and that sport and recreational fishing were minor at present.

17. The participant from India mentioned that in 1980 a fisheries census was conducted with the objective, among others, of identifying and locating the total number of fishermen that were full-time (90-100% of their time in fishing), part-time (30-90% of their time fishing) and occasional (less than 30%).

18. The participant from the Philippines pointed out that classification of fishermen into categories was not included in the national statistical system but data were available for seasonal fishing activities.

Training

19. In most countries in the regions there is still lack of training in collecting and processing statistical data. The participants agreed that budgetary limitations often constituted a major constraint for the implementation of training programmes, especially

for integrated programmes, as their objectives covered many and non-overlapping disciplines.

20. The participants agreed that in addition to the training of enumerators, observers, statisticians etc., in statistical techniques there was also an increasing need for training in data processing techniques and the use of computer equipment.

21. The participant from India reported that considerable progress had been made for intensive training of full-time enumerators and supervising officials and he pointed out that the training activities were also covering a wide spectrum of calculating techniques applicable to various types of computing equipment. The Central Marine Fisheries Research Institute, Cochin, India (CMFRI) could be a venue for training programmes in the methodology and procedures for collection and processing of data.

PRESENTATION OF NATIONAL REPORTS

22. The national reports were presented by the participants of the individual countries.

23. The participant from New Zealand stated that the total allowable catch for the 1984-85 period was set at 369,000 tons for fish species (excluding tuna taken by tuna fisheries) and 90,000 tons for squid. The provisional catch figures for the 1984 calendar year and for domestic catches amounted to 260,000 tons of demersal and pelagic species, 9,250 tons of tuna, 115,800 tons of squid and 22,000 tons of crustaceans and molluscs. The fishing fleet which operated in the New Zealand waters during 1984 consisted of about 2,800 domestic and 270 foreign vessels. The Fisheries Statistics Unit (FSU) attached to the Fisheries Research Division of the Ministry of Agriculture and Fisheries, was responsible for the collection, processing and dissemination of all catch and fishing effort statistics, collected from domestic and foreign vessels through a statistical system based on a complete coverage. Fishermen were required by law to register their vessels and obtain fishing permits for each fishing period. They also completed detailed catch and fishing effort forms which were especially designed to cover different types of gear, fishing methods and vessels.

24. The participant from India stated that estimation of marine fish landings in India was primarily made on the basis of data collected through large-scale sample surveys following a stratified multi-stage random sampling design. The survey covered over 1,400 landing centres spread over a coastline of about 6,100 km of mainland. The landings of artisanal and small mechanized boats which accounted for over 97% of the total catches were covered under the survey programme. The estimated marine fish landings in 1984 was 1.63 million tons (provisional). Pelagic species accounted for 54% as against 46% for the demersal group. As a single species oil sardine contributed the maximum (13.1%) of the total landings. Among the states, Kerala ranked first accounting for 26% of the total production; 66% of the landings came from the small mechanized sector and 34% from the artisanal sector. Catch data on coastal fisheries were also collected by the State Fisheries Department. They generally followed the sampling design evolved by CMFRI. Off-shore data collected from Government of India vessels were readily available for incorporation, but only limited data were available on catches by larger vessels owned by the private industry. Efforts were being made to collect such data from industry and the programmes for this purpose had been standardized.

25. The participant from Japan stated that the fisheries statistics were prepared by the Fisheries Statistics Division of the Statistics and Information Department, Ministry of Agriculture, Forestry and Fisheries. The infrastructure of the statistical system comprised the headquarters, eight regional and thirty-six prefectural offices. Each prefectural office held about five local branch offices which acted as the key data collection centres in the system. The total number of personnel involved, including administrative and secretarial services, was about 1,500. The statistics were compiled for the four major sectors in fisheries, namely (1) fisheries census for the review of the infrastructure of fisheries and the roles the components play in the industrial and economic fields in Japan; (2) fisheries production for marine fisheries, mariculture, inland fisheries and freshwater aquaculture; (3) marketing and distribution of fresh and

processed products and (4) fishery household and fishery establishments economic survey. Compilation of these statistics was generally made on both a monthly and annual basis, with the exception of the fisheries census which was carried out every five years. The catch and effort data were collected through two different methods: one from the landing records kept at wholesale markets at various levels and the other from the summary log-books submitted directly to the government by fisheries enterprises. The former covered all the coastal and small-scale offshore fisheries which were licensed by prefectural government and the latter the large-scale offshore and Far Seas fisheries which were licensed by both the prefectural and central governments. The total number of wholesale markets involved in the first category exceeded 2,000; about 45 large markets for central to regional levels which were supervised by local governors and about 2,000 small markets for local levels supervised by local fisheries cooperatives. Due to the strict licensing system and its efficient enforcement, as well as the deep involvement of fisheries cooperatives in management of fisheries in Japan, the data collected through these schemes were fairly reliable. The statistics on fisheries economics relied also on dual data bases, namely, the entire survey on the revenue and expenditure report for the large industrial fisheries and the sampling survey on selected fisheries households and enterprises by questionnaires, for smaller-scale fisheries. The processing of all the data mentioned above was made by a large mainframe computer in the central office. The basic method of the processing was firmly established around 1970 and since then no substantive change in the processing and format of the statistical tables to be released to the public had been introduced. At the same time the contents of national fisheries statistics had also been strictly defined at the Ministerial level to ensure that they remained consistent through the years. Only minor revision of the items and format had been made so far in connection with changes in the structure and production in specific sectors in Japanese fisheries.

26. The participant from Mauritius stated that the major fisheries at present comprised the artisanal operations of Mauritius and Rodrigues and the exploitation of resources on the offshore banks of St. Brandon, Nazareth, Saya de Malha and the Chagos Archipelago. The fishery provided fresh, frozen and cured fish to the local market. The lagoon and off-lagoon areas were presently being exploited by approximately 3,000 fishermen using lines, basket traps, nets and harpoons. The fishermen operated in about 1,200 pirogues - 40% of which were motorised. These fishermen landed approximately 3,000 tons of fresh fish annually. The banks fisheries provided about 4,000 tons of frozen fish annually. The fish were caught with handlines by fishermen operating from dories brought to the banks by a mother vessel. The catch per unit effort of the artisanal fishermen was about 5 kg whereas that of the banks was approximately 120 kg. About 3,000 tons of tuna (mainly yellowfin and skipjack) were caught by a purse seiner "Lady Sushil" for the cannery, which exported its canned product to the EEC countries.

27. The participant from Thailand stated that the fisheries industry had rapidly developed and expanded since the early 1960's. Over 90 per cent of annual fish production was marine fish caught from the Gulf of Thailand, the South China Sea and the Andaman Sea. The trawl fisheries yielded over 60 per cent of the annual marine catch. The remaining percentage was shared by pelagic fisheries, dominated mainly by purse seiners and gill nets, by small-scale fisheries and by shell fish fisheries. Statistical data collection in Thailand was based mainly on surveys carried out by field statisticians of whom 6 supervisors and 70 enumerators had been assigned to this survey. A new marine fisheries production survey system, based on sampling theory, was established in 1969 using the results of the 1967 first Marine Fisheries Census. The survey covers all types of marine fisheries including mariculture and brackishwater culture. The objectives of the survey were to secure the data necessary for fisheries administration and for fish stock assessment by providing catch data by species/species group, by gear, by areas and by month and effort (in units of numbers of trips, days, trawls and hours) for the major fishing gears (i.e. otter board trawl, pair trawl, beam trawl, Thai purse seine, Chinese purse seine, luring purse seine, anchovy purse seine, encircling gill net, king mackerel drift gill net, push net and bamboo stake trap). If any particular fishing gear was distributed into strata, then the random technique was applied to each stratum for data collection. Marine fishery production surveys were broadly classified into 4

surveys i.e. marine fisheries production from major fishing gear (log book survey), fishing communities survey, coastal aquaculture survey and particular fisheries survey. Apart from these surveys, a fish landing-place survey and an associated fisheries industries survey were also carried out. Statistical data were collected by field enumerators who visited selected sample places regularly. All information was forwarded to the statistics headquarters in Bangkok for further compilation, processing, evaluation and dissemination. The results were presented through various statistical yearbooks. Following the second marine fisheries census, conducted in 1985, it was hoped that the new information obtained would be used for the improvement of the quality of statistics collection, particularly the national fishing gear classification which had been established a long time ago and had not been adjusted in relation to changes in patterns of fishing.

28. The participant from Tanzania stated that 1983 marine fish catches for mainland Tanzania amounted to 34,485 tons worth 461 million Tanzanian shillings. The fish were caught by more than 9,500 fishermen from 2,382 fishing vessels. The main fishing gear were gillnets, handlines, traps, longlines, beach seines and cast nets. Industrial fisheries used trawl nets and purse seines. More than 90% of the total marine catches were made by artisanal fishermen. In 1983, catches from the industrial fisheries amounted to only 1,115 tons. Data on fish landings and effort of the artisanal fisheries were collected daily from selected important fish landing centres along the whole 800 km coastline. The sampled daily catches were used to calculate an average catch per boat per day. From an annual survey of fishing gear, a raising factor was obtained which was used to calculate the total monthly catch in the region using the average catch rate. The annual catch was the sum of the monthly catch estimates. Catch data of industrial fisheries were obtained from returns of the fishing companies. The results of the catch estimates and effort data were tabulated for each region and published annually by the Fisheries Division. Recently, there had been a slack in the collection of data due to problems of supervision of enumerators as a result of decentralisation. FAO had been requested to assist in improving the methodology and implementation of a reliable national fisheries statistical system.

29. The participant from the Philippines stated that the statistical data production system had improved significantly over the last five years as a result of the technical assistance extended by FAO since 1976 and the desire of the Bureau of Fisheries and Aquatic Resources to generate adequate and accurate data. Notable improvements included: 1) The adoption of a statistical sampling system that now covers 85% of the country's fishing; 2) production data for the artisanal fisheries (there were none prior to 1976) and 3) production data for inland water open fisheries (there were none prior to 1981). The statistical collection system followed the FAO species identification sheets and a complete listing of fishing grounds, of boats and gear, but the production data were adequate only for production estimates and not for development, management or investment advice. Since the publication of the statistical data did not include recent figures, the data might be of limited value for immediate decision making. For a sound management of fishery resources the present statistical system would have to be upgraded and its data coverage expanded to include vitally important information such as details on catch and fishing effort, socio-economic/biological data, integrated data for stock assessment etc. This would mean more resources allotted to fishery statistics and a closer collaboration between statisticians and researchers.

30. The participant from the People's Democratic Republic of Yemen stated that his country had a coastline of 1,500 km. Fisheries were an important national resource and played a crucial role in the economy; however resources available to the small scale artisanal fisheries were considered to be under exploited. There were 14 cooperatives by 1982 consisting of 6,500 fishermen. The principal craft engaged in fishing were the "sambouks" and "houris". The larger of the sambouks had 10 crew members, and an inboard engine of 45 h.p; the smaller sambouks had a crew of 3-4 members, and an inboard engine of 15-24 h.p. The houris were small, with, at most, outboard engine of 8-15 h.p. The reported average production from the houri was 15-20 tons per year. The smaller sambouks,

6-8 m in length, averaged a production of 24 tons per year, while the larger, 13-15 m in length, averaged 60-120 tons per year. The industrial fishery was a developed sector. The Yemeni Fishing Corporation operated about 19 stern freezer trawlers of various sizes and capacities. The Yemeni-Soviet Expedition also ran on lines similar to the Yemeni Fishing Corporation. The fishing was primarily for lobsters, cuttlefish and demersal fish. The total catch of fish and other fisheries products in 1984 was 84,100 tons; in 1983 it was 74,200 tons. Fisheries statistics and biological data collection were well organized for some commercial species. This was not the case for other species, the reason being the limited number of trained people in data collection and the long distances between the landing sites for the artisanal fishery.

PROGRESS MADE IN THE PROCESSING OF NATIONAL STATISTICAL DATA

31. The participant from New Zealand described briefly the situation of the national statistical programme before 1982 and explained the reasons that led to the establishment of the Fisheries Statistics Unit (FSU) for the collection and processing of statistics. With the establishment of the FSU one group became responsible for the collection, processing and dissemination of the statistical data. The major task of the Unit was to ensure that timely, accurate and detailed catch and fishing effort figures were available to the fisheries scientists and managers for the proper management of the national fisheries. The data were available to all staff of the Ministry of Agriculture and Fisheries via a nationwide computer network owned by the Ministry. The statistical system used at present was an integrated data-base with built-in procedures for the detection of traceable errors and the monitoring of the data flow. With one exception (vessel register) all the database components were updated on a centralized basis to ensure better quality of data, although technically, the present network also allowed for distributed processing. Special procedures permitted unsophisticated users to request and receive statistical tabulation with data extracted from the database and combined in different ways. Selected data were also treated by users with knowledge of computer programming for special analytical purposes. In the discussion that followed the participant from New Zealand answered questions related to the capacity and performance of the computing system used by FSU, and to the basic features of the statistical accounting system which monitored the flow of the input documents.

32. The participant from Thailand stated that Thailand had recently established a Fisheries Computing Section which would provide the means and methods for computer-based processing of historical and current fishery statistics. It was expected that the introduction of automated processing techniques would speed up the preparation of the official statistical publications and at the same time it would prepare the ground for further development of statistical applications.

33. The participant from Japan stated that passing from manual to electronic processing had been an early general consideration in Japan and in 1970 a five-year programme was implemented for the gradual conversion of an almost entirely manual system to a new structure characterized by a "fixed number" of Government employees; this meant that increased demands should be met by increased efficiency rather than by increases in staff. Since then the national fisheries statistical system of Japan had been fully computerized and provided users with a variety of services.

34. The participants from India stated that the Central Marine Fisheries Research Institute (CMFRI) was the focal organization at national level for the collection and processing of marine catch statistics through a multi-stage stratified probability sampling design covering the entire coastline. Data collected by the Institute's field

staff were sent to the Data Centre of CMFRI where they were scrutinized and processed by the computing staff under the direct guidance of a team of qualified and experienced scientists in the statistics discipline. The basic computations were done with the help of electronic desk calculators and micro-computers. Handling of large volumes of data, covering also other related disciplines, would be performed by a mainframe computer which was being installed. In the near future the Institute would establish a computerized information system for the quick dissemination of statistical information to various user sectors. Automated methods for research on ocean resources were performed by a 71.5 metre fishery oceanographic research vessel equipped with built-in computerized systems for collection and processing of data on environmental and fishery parameters. With the establishment of the Remote Sensing Centre at CMFRI to work in collaboration with the Space Application Centre, space technology would be increasingly used in the management of marine living resources and an appreciable widening of the existing data-base was expected.

35. The participant from Tanzania pointed out that there had been no substantial progress in the electronic processing of statistical data, due mainly to the lack of staff experienced in programming and operating computer equipment .

36. The participant from the People's Democratic Republic of Yemen stated that progress in electronic processing of statistical data was slow because of the scarce computer training and maintenance facilities.

37. The participant from the Philippines stated that there was a centralized computer-based system for the processing of national statistical data and for the production of the official statistical publications. However, due to the incompleteness or absence of reliable statistics on fishing effort exerted by fishing ground, it was not possible to use the computer system for effective fishery management.

38. The participant from Mauritius stated that the small computer installed in Albion Fisheries Research Centre was quite adequate for the statistical needs at present and that the monthly statistics required for data analysis were produced without undue delays.

IDENTIFICATION OF THE KIND OF INFORMATION BEING COLLECTED AND ACTUAL DATA REQUIREMENTS

39. The Technical Secretary stated that on the basis of what had already been discussed, the participants should examine the various statistical requirements and consider feasible ways and means for these requirements to be met adequately. In connection with statistical requirements the following problems were likely to arise: (i) definition of present needs, (ii) types of data that would satisfy these needs, (iii) whether the existing statistics were adequate, (iv) what were the supplementary statistical data required and (v) resources required for the implementation of such components.

40. The participant from India pointed out that the coverage of data pertaining to EEZs needs to be considerably increased. He also pointed out the need to expand data-bases to include estuarine resources, bivalve resources and market statistics.

41. The participant from the People's Democratic Republic of Yemen pointed out that the incompleteness of catch and fishing effort data for the artisanal fishery led to difficulties when studying the exploitation of certain fish stocks. Of immediate use would also be the classification of fishermen by age, sex and occupational state, statistics on the trade of fish and fishery products and information related to fish processing such as cold storage plants, ice factories etc.

42. The participant from Tanzania stated that the statistical requirements of the country called for improved methods in data collection and processing as well as training activities for enumerators, statistical recorders and statisticians.

43. The participant from the Philippines referred specifically to the following statistical requirements: (i) statistics for monitoring major fisheries such as pelagic shared stocks, (ii) improvement of the species classification in both quality and level of detail and (iii) for detailed catch and fishing effort statistics the collecting effort should be proportional to the importance of the species observed.

44. The participant from New Zealand pointed out that however carefully a statistical system was planned, there would always be demands for further data expansion, especially in the field of biological research. Another concern of the Fishery Statistics Unit was the integration of the existing statistics with data from other domains such as trade of fish and fishery products, fish disposition and prices, socio-economic information etc. It was stated that, in many cases, difficulties in obtaining statistics were due to the fragmentation of the data rather than to their lack.

45. The participant from Thailand observed that catch and fishing effort data from offshore fisheries were fairly adequate for stock assessment purposes and that the recent establishment of a Computer Section would increase their availability. In the sector of inshore fisheries the problems were related to the collection system and specifically to the statistical coverage of a large number of fishing sites by a relatively limited number of enumerators. Improvements were also required in collecting statistics from vessels fishing in distant waters; the quality of data would improve if the information were given less reluctantly and if cases of overlapping with offshore fishing occurred less frequently. Another requirement is the re-examination of the classification of fishing gear which was established in 1969. Also of great importance would be the availability of cost-effective statistics for trawlers which constituted a major sector of the national fisheries.

46. The participant from Japan stated that the data collection schemes for catch and fishing effort statistics were based on complete coverage and due to the strict licensing system and the involvement of fisheries cooperatives in management of fisheries in Japan, the data obtained were, in general, fairly reliable.

47. The participant from Mauritius stated that the existing statistical system responded fairly well to the country's requirements, particularly for the lagoon, off-lagoon and bank fisheries. Improvements were required in the standardization of fishing effort data from the bank fisheries.

THE FAO/SEAFDEC WORKSHOP ON SHARED STOCKS IN SOUTHEAST ASIA

48. The Secretariat gave a brief presentation of the Summary Report of the FAO/SEAFDEC Workshop on Shared Stocks in Southeast Asia. It was pointed out that the investigation of problems in shared stocks was given high priority as almost all countries in the area were fishing intensively and the fishery administrations were conscious of the need for rational utilization of the exploited shared resources. In the discussion that followed the participants commented on the report and the following points were raised:

- which of the stocks were shared and how they were shared
- whether certain pelagic species should be included in the list of shared stocks
- adequacy and feasibility of methods for studying seasonality, mobility and route changes in migratory shared stocks
- adequacy of existing national statistics for appraisal of the status of shared stocks and their volume of migration
- action to be taken for the establishment of an integrated data collection and data processing system of shared stocks and methodological aspects of data analysis.

49. The Technical Secretary presented a note for discussion (see Appendix D), containing methodological and sampling aspects in catch estimation of shared stocks. Specifically, he explained the statistical meaning of the volume of migration, the need for constructing geographic frames and the importance of standardized area grid systems for accurate catch estimates and identification of migratory routes. In discussing catch estimation methods on shared stocks he made clear distinction between design-based and model-based approaches and in evaluating their adequacy he pointed out that design-based approaches had a lower level of precision because they did not take into account peculiarities observed in the movements of the stocks. Following this he referred to building up procedures in the survey system, to supplementary requirements in data collection and to analytic uses of data.

50. The Secretariat presented a note for discussion (see Appendix E) containing data processing aspects in the employment of computer-based techniques for the statistical analysis of data on shared stocks. In presenting the paper reference was made to possible approaches which could be used for the acquisition, storage, analysis and exchange of statistical data related to shared stocks, namely:

- definition of the minimum indispensable data items to be collected by each of the countries
- preparation of a computer system of common use for the standardization of statistical data
- establishment of a Regional Data Base (RDB) for the integration of standardized national statistics
- development of computer-based techniques for the interpretation and presentation of integrated statistics on shared stocks.

51. In the discussion that followed the participants commented on the paper and the following points were raised for further consideration:

- whether standardization and comparability between national data collections was feasible
- adequacy of national data (whether standardized or not) as the overall quality of an RDB is related directly to the data with the "lowest" quality
- criteria for designating a National Fisheries Data Centre to host the RDB
- sponsoring the development of computer systems for special analytical methods to be applied on data on shared stocks.

THE QUALITY PROBLEM OF NATIONAL FISHERIES STATISTICS

52. The Technical Secretary introduced Item 4.3 of the Agenda on the quality of fisheries statistical data and the importance of quality checks as a means of ensuring accuracy in survey estimates of large-scale fisheries statistical surveys. The various types of errors encountered in statistical data collection were identified and their effects on various statistical measures were presented. The two major groups of potential errors which were identified were coverage errors and procedural errors. Errors of the former category included incomplete coverage of all national fisheries and of foreign vessels operating within the exclusive economic zone of the country, unknown weight of discards, omission of information on essential characteristics such as effort data etc., and inadequacies in the established national tabulation programmes. Procedural errors included errors committed at the preparation stages, such as species lists, gear lists etc., errors committed in the design process of large-scale surveys - specifically of surveys based on sample methods, measurement errors committed at the stage of data collection and species identification, and processing errors. It was pointed out that systematic errors arising on different grounds combined in a joint effect. The net effect of the separate biases, which were algebraically additive, resulted in the overall bias. Various techniques were proposed for assessing the occurrence of systematic errors and debiasing calculated estimates. The various proposed techniques were divided into two broad categories: (i) Post-hoc techniques

which employed internal and external check methods; these techniques do not require field work operations and (ii) coverage check programmes and quality check programmes; these programmes are based on small-scale sample surveys.

53. The participant from India stated that field statisticians and scientific staff were well aware of the possibility of bias in their estimates. National workshops and statistical reviews were held at regular intervals with the purpose of identifying possible causes of bias and improving the sampling operations through the use of well-defined statistical methods.

54. The participant from New Zealand pointed out that as the method of data collection was based entirely on complete coverage, statistical techniques to reduce bias were not applicable. Instead, emphasis was put on computer-based error checking procedures which, in addition to trivial data verifications were sophisticated enough for drawing attention to "unlikely" figures. With these tools and with personnel experienced in specific fisheries sectors, it was possible to detect qualitative as well as quantitative errors otherwise untraceable.

55. The participant from the Philippines expressed the general view that when the freshly collected or processed statistical data were suspected to contain errors, it was important to know when, how and where these errors were entered into the data collection. Additionally, data producers had to be educated to become aware of the possibility of errors as they had the tendency to be less error-conscious than the data users.

56. The participant from Thailand recognized the importance of established statistical methods for error detection as well as the need for well-planned surveys and educated field personnel. He stated that indirect error-checking techniques, for instance the comparison of statistics collected from different but inter-related surveys, could also be of great help for the explanation of abrupt changes in the trend of statistics.

57. The participant from Japan pointed out that as the national scheme for data collection was based on complete coverage, statistical techniques to reduce bias were not applicable. Indirect methods were used at regular intervals by comparing statistical data from the catch assessment survey against data on landings collected by different statistical methods with the purpose of explaining the significance of any discrepancies.

58. The participant from Mauritius stated that since 1977 the quality of the national statistical data had improved with the recruitment of enumerators from the Protection Service. Field Staff were experienced and confident and the establishment of national workshops at regular intervals helped them and their supervisors to identify the areas which constituted possible sources of errors.

QUICK METHODS IN DATA COLLECTION

59. The Technical Secretary introduced Item 5 of the agenda on the use of aerial surveys in data collection. It was stated that Aerial Frame Surveys (AFSs) conducted so far aimed to provide information on the inventory characteristics of the traditional and artisanal fisheries and semi-industrial fisheries. Aerial frame surveys had also been conducted aiming at quick evaluation of surface fishery resources. The following spectrum of characteristics was obtained through AFSs; localization pattern of the survey fishing boats, number of fishing boats and by type, gravity centres of concentration of fishing boats and estimates of the fishing activity coefficient during the survey period. The reasons mentioned which justified the use of aerial work in data collection were: its efficiency in identifying fishing populations, the speed with which it produced results and the fact that it can be repeated frequently at relatively low cost. Specifically, aerial work in fisheries statistical studies was evaluated against the following four criteria: utility, cost, speed of performance and repeatability. The simplicity of the method and its operational steps were described and information was provided on the overall cost of aerial surveys conducted in a number of member countries.

60. During the discussion that followed his presentation, the Technical Secretary answered several questions related to aerial surveys such as criteria for utilization, level of accuracy, cost effectiveness etc.

MAJOR FISHING AREAS AND SUB-DIVISIONS

61. The Secretariat introduced agenda Item 6 concerning the existing boundaries between fishing areas 57 and 71 at the northern entrance of the Strait of Malacca. The introduction was followed by a presentation of background information and of views expressed at other meetings by a number of countries about whether the Strait of Malacca, shown in Western Central Pacific (Area 71), should be shown in the Eastern Indian Ocean (Area 57).

62. In the discussion that followed the participant from Thailand expressed the opinion that such a re-mapping could be considered justifiable if there was enough evidence of close inter-relation between the resources in the Strait and those in the eastern part of the Bay of Bengal. The discussion was concluded with the suggestion that FAO should examine the problem in more detail and, in consultation with the member countries concerned, prepare a proposal for an appropriate revision of the boundaries.

RECOMMENDATIONS

The Working Party recommended that:

1. Higher priority must be given by the Government Fishery Agencies to fishery statistics, mainly concerning resource allocations, such that the national data collection systems give the best possible information.

2. National statistical systems must expand their coverage and orientation in data collection in order to meet the urgent needs of the various users of fisheries statistics for additional and more detailed items of information.

3. Action must be taken for establishing the mechanism required for speeding up the process of fisheries statistical development in the region and the use of the proper statistical methodology by the national statistical systems in data collection and by using the principle of integration on statistical standards, concepts and definitions.

4. A workshop should be held in the future on the effectiveness of existing national fisheries statistical systems and processing techniques used, the existing level of integration between them, and on techniques which can be used by the member countries for their improvement.

5. All countries adopt the principle that no fisheries statistics data should be released without some quality check.

6. A seminar should be held in 1986 on quality check techniques which can be used for assessing the quality of the existing statistics and de-biasing calculated estimates. Emphasis should be placed on the use of cross-checking techniques and computer error checking methods and the preparation of a practical manual or a technical report.

7. A workshop should be held in 1986 on the statistical, sampling and data processing techniques to facilitate further the appraisal of shared stocks and their volume of migration and on the establishment of national data centres of shared stocks and a regional database.

8. In the absence of national sampling frames or in case of incomplete sampling frames, aerial frame surveys should be used for the collection of the required inventory items of information for the traditional, artisanal and semi-industrial fisheries.

9. FAO should consider the provision of consultancy services on request by member countries for the upgrading of their survey systems and processing techniques.

ADOPTION OF THE REPORT

The Report of the Sixth Session of the IPFC/IOFC Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics was adopted on 10 May 1985.

APPENDIX A

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APPENDIX B

ANNOTATED AGENDA

1 Procedural and organizational matters

2 Action taken on recommendations resulting from the Fourth and Fifth Sessions of the Working Party

3 Country reports

3.1 Statistical account of national fisheries (artisanal, industrial) in 1984. Tabulated data on catch rates, catches, fishing effort and size distribution of landings.

3.2 Progress made at the national level on data collection (artisanal, industrial sectors) and the processing of statistical data in the last five years.

4 Identification of areas which deserve special attention

4.1 Identification of the kind of information being collected at a national level (artisanal, industrial) and actual statistical data requirements. Preparation of a matrix table covering the spectrum of requirements.

4.2 The adequacy of national fisheries statistical systems to provide the required information on catches of shared stocks in Southeast Asia. Consideration of methodological and sampling aspects which may be employed for obtaining the required information.

4.3 The quality problem of national statistics produced: Emphasis should be placed on the identification of the various kinds of systematic errors occurring in national fisheries statistical systems for data collection (artisanal, industrial sectors), and consideration of practical quality-control methods which may be used aiming at improving the reliability of the produced statistics.

4.4 Practical problems involved in expanding the level of coverage of the national statistical systems in data collection and by using the principle of integration.

5 The use of quick methods for data collection. The use of Aerial Surveys for the collection of inventory characteristics of the artisanal fisheries will be discussed. Case study India.

6 Major Fishing Areas and Sub-divisions

7 Adoption of the Report

APPENDIX C

LIST OF DOCUMENTS

IPFC/IOFC:ST/85/1 Annotated Provisional Agenda

2 Provisional Timetable

3 Reports of the Fourth and Fifth Sessions of the Working Party

4 Summary Report of the FAO/SEAFDEC Workshop on Shared Stocks in Southeast Asia

- Methodological and sampling aspects in catch estimation of shared stocks (a note for discussion)

- The use of computer-base techniques in the study of shared stocks (a note for discussion)

5 Aerial frame survey along the southwest coast of India

6 Major fishing areas and sub-divisions

IPFC/IOFC:ST/85/Inf. 1 List of documents

2 List of participants

Background material

1 FAO Yearbook of Fishery Statistics - Catches and Landings, Volume 56

2 FAO Yearbook of Fishery Statistics - Fishery Commodities, Volume 57

3 Caddy, J.F., 1982 Some considerations relevant to the definition of shared stocks and their allocation between adjacent economic zones. FAO Fish.Circ., (749): 40 p.

4 FAO-FIP/R280/82: The quality of fisheries statistical data (fish production statistics).

5 Bazigos, G.P., 1984 The use of light aircraft in statistical surveys - Aerial Frame Surveys. Ninth United Nations/FAO International Training Course in cooperation with Government of Italy, Rome, 10-28 September 1984.

6 Bazigos, G., Henderson, H., 1975 Indicators of movement useful to problems of biomass estimation of pelagic stocks, FIPS/FIRS/T.140, FAO.

APPENDIX D

Methodological and Sampling Aspects in catch estimation of shared stocks

by
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1. Introduction

An FAO/SEAFDEC Workshop on Shared Stocks in Southeast Asia was held in Bangkok, 18-22 February 1985. The objectives of the Workshop were, among other things, identification of shared stocks in the area and the identification of important gaps in knowledge. Recommendations were also made on statistical data requirements:

a. Standardization of the survey species and species groups recorded

b. Standardization of fishing effort units on a national basis and the relationship between the standard units of the countries sharing the stocks

c. Use of standard rectangles (such as 30' x 30') for recording the origin of catches, and

d. Preparation of summarized tables on catch and effort data on a monthly basis.

This note discusses methodological and sampling aspects in catch data collection of shared stocks and presents a model-based approach which can be used in estimation.

2. The target population

The Workshop used the definition of a "shared stock" adopted by the United Nations Convention on the Law of the Sea, which defines a shared stock as "the stock occurring within the exclusive economic zone of two or more coastal states, or both within the EEZ and in area beyond and adjacent to it (Article 63). It was noted that the sharing of stocks between countries arises from the movement of the fish across the boundaries between adjacent EEZs. By taking as a criterion the type of movement of the fish, shared stocks were grouped into the following two categories:

1. Migratory shared stocks: stocks with regular pattern of migrations between spawning areas, nursery grounds, juvenile feeding areas, adult feeding areas and ecological migration.

2. Trans-boundary stocks: Stocks showing only limited or random movement across a boundary.

Appendix-1 shows a number of stocks in the Southeast Asian Region which were identified in the Workshop as shared stocks.

3. The statistical meaning of the volume of migration

From a statistical point of view, migration of a fish stock is a process which alters the size of the survey population in the EEZs. Migration data always have a specific reference to a period of time. There are two aspects to the measurement of movement: position and change or transition; the quantity of fish within a particular area may be taken as one position. After a period of time, a new quantity of fish is observed in the same area. The difference between these two quantities of fish may thus be regarded as measuring a movement of fish, although in the more usual sense it would be regarded as a change brought about by movement (reproduction and death are alternative sources of change in concentrations).

4. Geographic frames

Mapping materials are required to portray graphically the character of the movement of the survey shared stocks. A detailed geographic frame[1/] provides the needed information on the character of the EEZs e.g. EEZs with spawning, nursery grounds etc., location and size of the migratory routes, depth domains of movement of fish and their migration seasonality pattern. For the construction of a detailed geographic frame, various sources of information can be used e.g. available historical catch data, biological information, data of conducted acoustic surveys, etc.

5. The use of a grid system

Super-imposing a grid system, say 30' x 30', on the EEZs would simplify both the collection of the required data on the origin of catches, on a small area of resolution and the process for the identification of the migratory routes of the survey shared stocks. These kind of data can also be used in the process for the calculation (estimation) of the volume of migration of the survey shared stocks.

6. Catch estimation of shared stocks

6.1 Design-based approach in estimation

The design-based approach in estimation is used by the national fisheries statistical systems in their catch assessment surveys. Total catch estimates and on species/category of fish basis is obtained within the overall system of work. The survey strategy of this type of design neither takes into account existing peculiarities in the behaviour of certain categories of harvestable stocks nor specific requirements in data collection for the purposes of analysis. Usually, the level of precision of the calculated survey magnitudes is unknown. The statistical power of the obtained data is limited for accurate catch estimates of the survey magnitudes and the calculation of the volume of migration of the survey stocks.

6.2 Model-based approach in estimation

The proposed model-based design in catch estimation of shared stocks takes into account peculiarities observed in the movements of shared stocks and builds up the procedure into the survey design for obtaining the required items of information and considers models for the analytic uses of the obtained data. This approach creates precise estimates of the survey magnitudes and provides the mechanism for the estimation of the volume of

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1/ Garcia S., 1982 Distribution, migration and spawning of the main fish resources in the northern CECAF Area, Fishery Committee for Eastern Central Atlantic, CECAF/ECAF Series 82/25, FAO.

migration of the shared stocks.

a: Building up procedure in the survey system:

The proposed procedure asks for the preparation of a specific sampling frame of the industrial fishing units engaged in fishing operations of shared stocks and the use of a "supplementary" questionnaire for obtaining the required detailed items of information. For small-scale fisheries the method of double-sampling will be used for data collection on shared stocks. This procedure will be integrated with the overall survey system of work.

b: Supplementary requirements in data collection:

(i) Standardization of survey species and species groups recorded.

(ii) Standardization of fishing effort units on a national basis and the relationships between the standard unit of the countries sharing the stock.

(iii) Use of a grid system for recording the origin of catches.

(iv) The spectrum of detailed characteristics covered by the supplementary questionnaire will include structural and operational characteristics of the operating fishing units, fishing effort units, fish catch and by species, origin of catch and date of capture, and length measurements by sub-sampling the catch. A proper codification system should be introduced along the line which will simplify the process for the mechanical processing of the obtained data and by using the principle of integration.

c: Analytic uses of data

A computerized system would be developed for the analytic uses of the data; proposals were made in the Workshop for the establishment of national centres and a regional data base. This programme would include: a) a graphical analysis in statistical simulations, b) calculation of points estimates of the survey magnitudes, say, on a monthly reference period, and c) the estimation of the volume of migration of shared stocks.

The graphical display programme, among other things, can be used to explore the distribution of fishing effort over the successive occasions and the observed changes over time.

Monthly point estimates of the survey magnitudes and their level of precision would be calculated on a grid basis and the EEZ as a whole. Spatial serial correlations would also be calculated by using CPUE grid-data and by taking into account the pattern of movement of the fish.

A proper process would be developed for the estimation and graphical presentation of the volume of migration of shared stocks over time and by using catch and length measurements.

ANNEX E

The employment of computer-based techniques for the statistical analysis of data on shared stocks

by

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1. Introduction

One of the proposals discussed at the FAO/SEAFDEC Workshop on Shared Stocks (Bangkok, 18-22 February 1985), was the establishment of national data centres and a regional database in connection with shared stocks.

Specifically, in paragraph 32 of the summary report of the Workshop it was recognized that such a system would be of great value if installed in the region and that the subject of national data centres and regional database should be further discussed at the at the IPFC/IOFC Joint Working Party of Experts on Indian Ocean and Western Pacific Fishery Statistics.

This note discusses the data processing aspects of the subject and presents a possible approach which could be used for the storage, analysis and exchange of statistical data related to shared species.

2. Types and formats of statistical data

Although at this early stage it is difficult to identify in detail the data requirements for a study on shared stocks it is nevertheless apparent that a model-based approach should be followed, using statistical data supplied by all the countries involved in the study.

Once collected these data should be put under a commonly agreed and accepted type and format so that they could then be assembled together to form an integrated collection.

An effective way of storing and exchanging statistical data is the use of computer-based data processing and data communications techniques and in this connection it has been recognized that National Fishery Data Centres (NFDCs) can play a very important role in the acquisition, processing and dissemination of timely, detailed and accurate statistics.

NFDCs are different from country to country, their sizes, structures and activities depending on the national requirements and capabilities. The next paragraph discusses, in very general terms, some of the aspects of the NFDCs in the hope that this information might be of help for those countries which are in the process of establishing such structures.

3. Funding and staff requirements for establishing an NFDC

NFDCs are not necessarily synonymous with large structures equipped with ultra-sophisticated computing machinery and manned by highly specialized personnel.

With respect to computer equipment the current widespread use of low-cost microcomputers makes it possible for a country to establish an NFDC without structural or procedural changes to the existing Fishery Administration and without having to invest vast amounts of money in electronic equipment and computer site preparation.

As far as staff requirements are concerned an NFDC is usually established within an existing infrastructure thus taking advantage of the already existing administrative and operational support. In most cases the NFDC staff consists of an officer-in-charge of the statistical systems and data clerks for data handling and computer operations.

4. The need for a Regional Data Base (RDB)

Once the member countries are ready to exchange their locally collected and computer-processed statistical data on shared stocks, there will be a need to assemble and analyze these data at an "aggregate" level, for instance, sub-regional or regional.

Grouping together transmitted national statistics should be a function of a Regional Data Base (RDB) which should be developed by an existing data centre with proven capability of handling and analyzing large volumes of data. A successful RDB requires full support by and cooperation with each of the member countries because the effectiveness of the Regional Data Base will be entirely dependent on the quality, timeliness and completeness of the obtained statistics.

The following are the possible phases in establishing a Regional Data Base on shared stocks:

(1) Definition of the minimum indispensable data items to be collected and computer-processed by each of the NFDCs in the region.

(2) Preparation of a computer system to be commonly used by the member countries in order to exchange standard computer records with statistics on shared stocks.

(3) Establishment of a Regional Data Base (RDB) for the integration of nationally produced statistics.

(4) Development of computer-based simulation and statistical analysis models for the interpretation and presentation of shared stock statistics at sub-regional and regional level.

(5) Preparation of computer-based data dissemination techniques for the efficient exchange of statistical results; such techniques may include data communications, production and distribution of working papers, publication of official regional bulletins, etc.

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